

APPENDIX B

OCCUPATIONAL EXPOSURE POTENTIAL METHODOLOGY

The Occupational Exposure Potential (OEP), shown in Table 2.6, is a score derived from the product of three parameters qualitatively assigned by the Project Team. The parameters are airborne potential, constituent level, and exposure duration. Each parameter is assigned a numeric value according to prescribed criteria.

Airborne Potential

This parameter is a subjective assignment of the likelihood of the contaminant to become airborne or concentrated in air. The judgment is largely based upon the form of the material and the nature of the particular operation. An associated numeric value is based on the following criteria:

Value	Likelihood
0	No likelihood of being airborne
1	Low airborne potential
2	Moderate airborne potential
3	High airborne potential

Constituent Level

Calculations for each of the various product streams were performed to estimate the additional dose presented by constituents present in irradiated uranium over that of the uranium alone. The DOE EH-3 team provided a standardized tool, in the form of an electronic spreadsheet, to perform the dose fraction calculations. The calculation and its technical basis are described in detail in the *Historical Generation and Flow of Recycled Uranium in the DOE Complex Project Plan*. To use the tool, the following information about the process stream being considered was determined and entered in the spreadsheet:

- chemical form
- level of enrichment in the ^{235}U isotope
- mass fraction of the constituents ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{237}Np , ^{241}Am , ^{236}U , and ^{99}Tc

The required information was determined by assuming estimates based on available analytical data, process knowledge, and engineering judgment, and calculations were performed for the streams of interest. Assumptions for the calculations and the results are summarized in the accompanying tables.

The calculated fractional dose was then compared against criteria for assignment of a respective numeric value:

Value	Likelihood
0	Sum of constituents clearly below <i>de minimis</i> levels (clearly less than 10% additional dose)
1	Sum of constituents likely to cause up to 20% total dose
2	Sum of constituents likely to cause more than 20% but less than 50% total dose
3	Sum of constituents likely to cause 50% or more of total dose

Exposure Duration

This parameter considers the time of worker exposure on the job. As such, it considers whether or not a particular activity was conducted infrequently or was carried out on a daily basis. Exposure duration was also based upon a set of criteria to arrive at a numeric value:

Value	Likelihood
1	50 hours per year or less
2	More than 50 hours per year but less than 500 hours per year
3	500 or more hours per year

OEP Ratings

Multiplying the three values for airborne potential, constituent level, and exposure duration produces an overall value that falls within a range that determines the OEP score:

Score	Product Range	Likelihood
0	0	“No significant” occupational exposure potential
1	1	“Low” occupational exposure potential
2	2-9	“Moderate” occupational exposure potential
3	>10	“High” occupational exposure potential

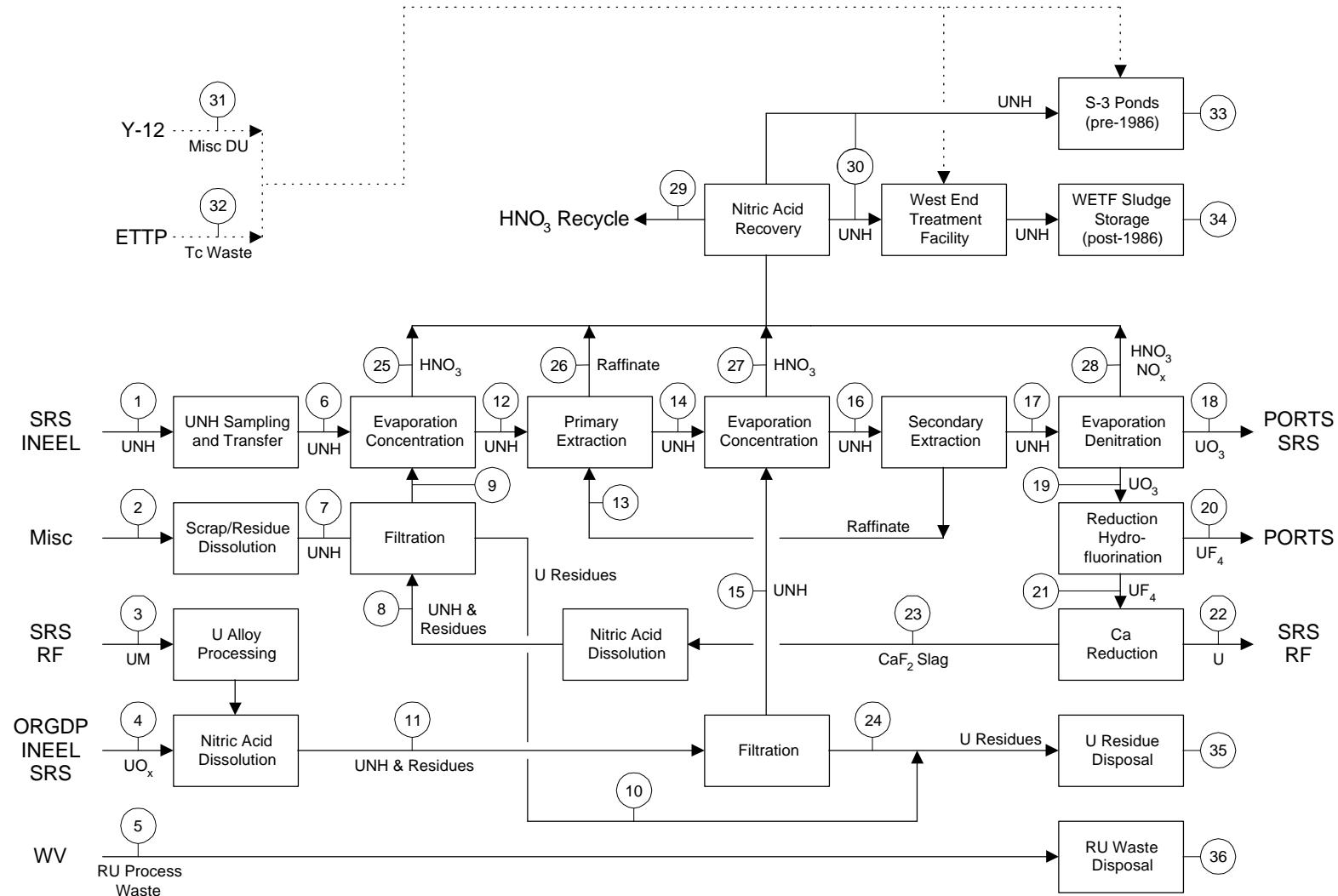
The results of this rating system for Y-12 Complex activities are presented in the following charts and tables, which were used to provide the OEP ratings presented in Table 2.6.

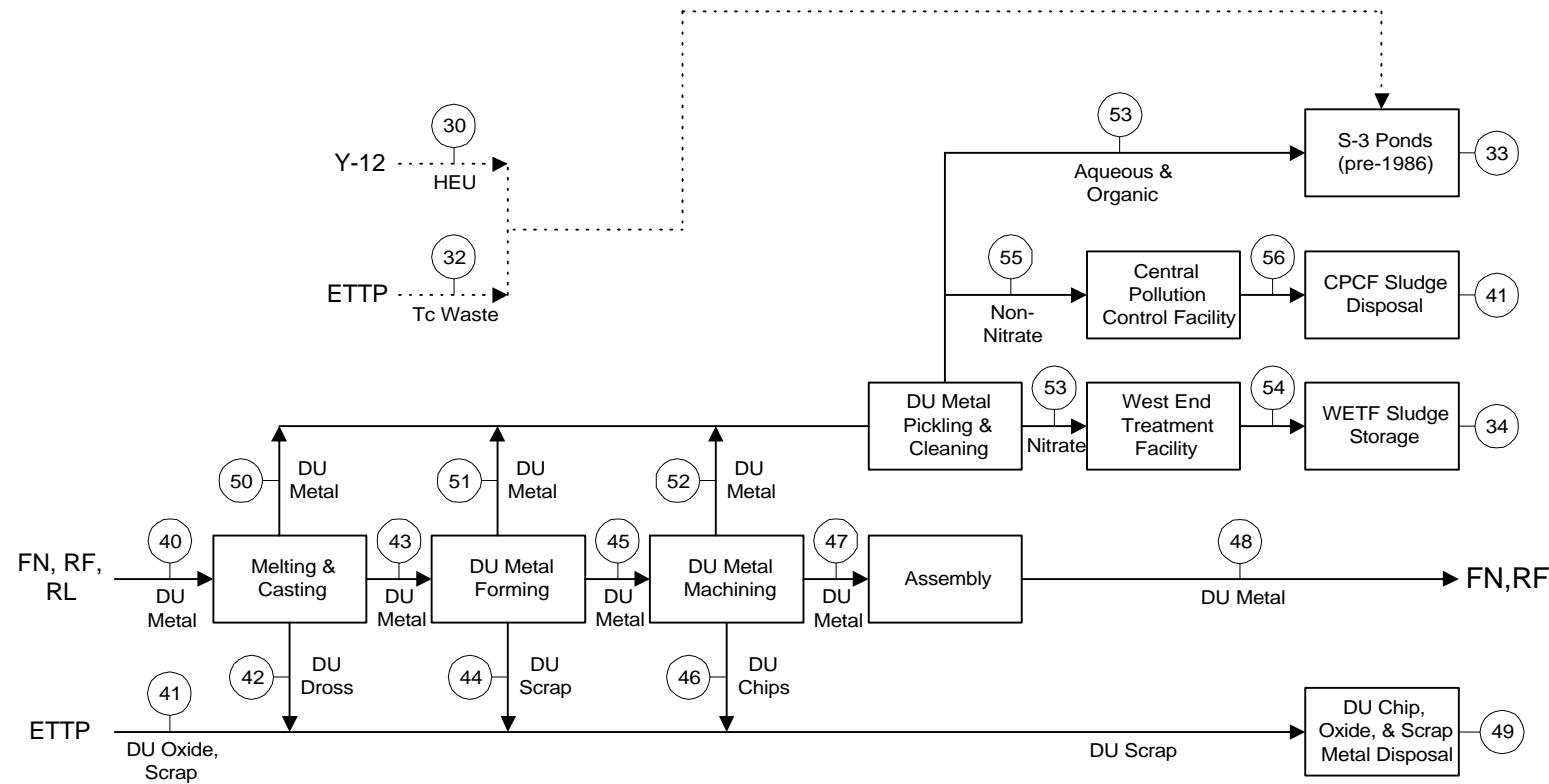
RU Occupational Exposure Potential at the Y-12 Complex

Y-12 HEU Activity	Stream Composition, U Basis				Exposure Potential			
	Pu ppb	Np ppm	Tc ppm	^{236}U %	Constit. Level	Airborne Potential	Exposure Duration	Occ. Exposure
Activities with Bldg 9212								
1A. ICPP UN soln received in safe bottles	0.11	4.7	0.13	10	2	0	1	no sig
1B. SR tanker truck weighed	0.36	28.8	82	27.8	3	0	1	no sig
1C. SR material sampled	0.36	28.8	82	27.8	3	0	1	no sig
1D. ICPP UN soln poured	0.11	4.7	0.13	10	2	1	1	low
1E. SR UN soln pumped to 9212	0.36	28.8	82	27.8	3	0	1	no sig
1F. SR/ICPP UN evaporated	0.36	28.8	82	27.8	3	1	2	mod
1G. Manual fill and load of UN in safe bottles	0.36	28.8	82	27.8	3	1	2	mod
1H. ICPP UO_3 received, dissolved to UN	0.11	4.7	0.13	10	2	2	1	mod
1I. Purification of UN via solvent extraction	4.5	346	211	27.8	3	1	3	mod
1J. Discard of raffinate to S-3 Ponds	62	2980	641	27.8	3	1	1	mod
1K. Feeding of raffinate to bioreactor	62	2980	641	27.8	3	1	1	mod
1L. Transport raffinate to WETF	62	2980	641	27.8	3	1	1	mod
1M. Denitration of SR/ICPP UN to UO_3	0.24	23.8	85	27.8	3	1	2	mod
1N. Maintenance on denitinator and fluid beds	0.24	23.8	85	27.8	3	3	1	mod
1O. Conversion of material to UF_4	0.24	23.8	85	27.8	2	3	1	mod
1P. Removal of dry UF_4 from process	0.24	23.8	85	27.8	3	3	1	mod
1Q. Bomb reduction to metal	0.24	23.7	72	27.8	3	3	1	mod
1R. Sampling, fracturing, packaging metal	0.24	23.7	72	27.8	3	2	1	mod
1S. SR U-Al salvage operations	0.23	22.5	81	27.8	3	1	1	mod
1T. Metal product shipped	0.23	22.5	81	27.8	3	0	2	no sig

RU Occupational Exposure Potential at the Y-12 Complex

Y-12 HEU Activity	Stream Composition, U Basis				Exposure Potential			
	Pu ppb	Np ppm	Tc ppm	²³⁶ U %	Constit. Level	Airborne Potential	Exposure Duration	Occ. Exposure
Activities with Bldg 9206								
2A. SRS UN soln poured into safe bottles	0.36	28.8	82	27.8	3	1	1	mod
2B. SRS U-Al ingots received	0.23	22.5	82	27.8	3	0	1	no sig
2C. SRS dross and sweepings received	0.23	22.5	82	27.8	3	0	1	no sig
2D. SRS U-Al dissolved in NaOH	0.23	22.5	82	27.8	3	1	2	mod
2E. SRS sodium diuranate dissolved in acid	0.23	22.5	82	27.8	3	1	2	mod
2F. ICPP UO ₃ received, dissolved to UN	0.11	4.7	130	10	2	2	1	mod
2G. Purification of UN	4.5	346	211	27.8	3	1	3	mod
2H. Isolating, trucking, piping raff to 9212	62.4	2980	641	27.8	3	1	1	mod
2I. Denitration of SR/ICPP UN to UO ₃	0.24	23.8	85	27.8	3	1	2	mod
2J. Maintenance on denitrators or fluid beds	0.24	23.8	85	27.8	3	3	1	mod
2K. Conversion of material to UF ₄	0.24	23.8	85	27.8	3	3	1	mod
2L. Removal of dry UF ₄	0.24	23.8	85	27.8	3	2	1	mod
2M. Bomb reduction to metal	0.24	23.7	85	27.8	3	3	1	mod
Other Activities								
3A. Closure of S-3 Ponds	1.4	65.9	200	3.0	3	2	1	mod
3B. Treatment of nitrate waste	1.4	65.9	200	3.0	3	1	2	mod
3C. RU material stored	0.24	23.7	85	27.8	3	0	1	no sig





Processing of Recycled DU in the Y-12 Plant

Processing of Recycled HEU
SRS RHEU Material Flow through Y-12

Steady State Flow Model (manual calc procedure to converge on recycle streams)

Feed Stream Definition, mass flows						Feed Stream Definition, concentration				Data Source
	MTU	Pu, gms	Np, gms	Tc, gms	Th, gms	Pu, ppb	Np, ppb	Tc, ppb	Th, ppb	
UNH	125.2	0.0455	3600	10260		0.363	28754	81949	0	Y-12 & SRS Analysis
UO3	0.00	0.0000	0.00	0.00		0.00	0.00	0.00	0	
U metal						0	0	0		
U-Al						0	0	0		
UF4						0	0	0		
Residues						0	0	0		
Other	0	0	0	0		0	0	0	0	
Totals	125.2	0.0455	3600	10260		0.363	28754	81949		

Feed Stream Concentrations												
	Pu, ppb/U	Np, ppb/U	Tc, ppb/U	U-234 %	U-235 %	U-236 %	U-238 %	Pu-238 %	Pu-239 %	Pu-240 %	Pu-241 %	Pu-242 %
UNH	0.363	28754	81949	1.39	62.6	27.8	8.21	84	14	2	0	0
UO3	0.000	0	0	1.39	62.6	27.8	8.21	84	14	2	0	0
U metal	0	0	0				100					
U-Al	0	0	0				100					
UF4	0	0	0				100					
Residues	0	0	0				100					
Other	0	0	0				100					
Average	0.363	28754	81949	1.39	62.6	27.8	8.21	84	14	2	0	0

U Mix Specific Activity	
dpm/g U	2.35E+08
$\mu\text{Ci/g}$ U	1.06E+02

Pu Mix Specific Activity	
dpm/g Pu	3.27E+13
$\mu\text{Ci/g}$ Pu	1.47E+07

Other Specific Activity					
	Np-237	Tc-99	Dep U	Nat U	93% U
dpm/g	1.56E+09	3.76E+10	9.00E+05	1.50E+06	1.40E+08
$\mu\text{Ci/g}$	7.04E+02	1.69E+04	4.05E-01	6.76E-01	6.31E+01
Ci/g	7.04E-04	1.69E-02	4.05E-07	6.76E-07	6.31E-05

β Activity of non-RU	
	dpm/ $\mu\text{g U}$
Th-234	0.0670
Pa-234	0.0670
Th-231	4.3197
Total	4.454

Feed Stream Activity								RU Comparison to WU				
	U, ci	Pu, ci	dpm/ $\mu\text{g U}$	Np, ci	dpm/ $\mu\text{g U}$	Tc, ci	dpm/ $\mu\text{g U}$	Th, ci	dpm/ $\mu\text{g U}$	α Ratio	β Ratio	γ Ratio
UNH	1.33E+04	6.69E-01	1.19E-02	2.53E+00	4.49E-02	1.73E+02	3.07E+00			0.2840	0.6903	
UO3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			0.0000	0.0000	
U metal	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			0	0	
U-Al	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			0	0	
UF4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			0	0	
Residues	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			0	0	
Other	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			0.0000	0.00000	
Totals	1.33E+04	6.69E-01	1.19E-02	2.53E+00	4.49E-02	1.73E+02	3.07E+00			0.2840	0.6903	

Notes:

α Ratio = (activity of Pu + Np per gram U)/nominal specific activity of EU*700

β Ratio = beta activity of sample per gram U/nominal specific beta activity of unirradiated EU

γ Ratio = $\mu\text{gram Ra-226 equivalent}/\text{gram U}$

Chemical Process Assumptions										
Process Step	Distribution of U		Distribution of Pu		Distribution of Np		Distribution of Tc		Distribution of Th	
	Product	Raffinate	Product	Raffinate	Product	Raffinate	Product	Raffinate	Product	Raffinate
HNO3 Dissolver	1	0	1	0	1	0	1	0	1	0
Liquid/Solids Filter	0.98	0.02	0.9	0.1	0.9	0.1	0.9	0.1	0.9	0.1
Primary Evaporator	0.999	0.001	0.99	0.01	0.99	0.01	0.99	0.01	0.99	0.01
Primary Extraction	0.99999	0.00001	0.7	0.3	0.8	0.2	0.98	0.02	0.99	0.01
Second Evaporator	0.999	0.001	0.99	0.01	0.99	0.01	0.99	0.01	0.99	0.01
Second Extraction	0.99	0.01	0.4	0.6	0.5	0.5	0.95	0.05	0.9	0.1
Denitration	0.999	0.001	0.999	0.001	0.995	0.005	0.999	0.001	0.999	0.001
H2/HF Fluid Beds	1	0	1	0	1	0	1	0	1	0
Ca Reduction	0.95	0.05	0.9	0.1	0.9	0.1	0.9	0.1	0.95	0.05
HNO3 Still to Recycle	0.001	0.999	0.001	0.999	0.001	0.999	0.001	0.999	0.001	0.999
Fraction UO3 Product	0	1	0	1	0	1	0	1	0	1
Fraction UF4 Product	0	1	0	1	0	1	0	1	0	1
Fraction to WETF	0	1	0	1	0	1	0	1	0	1

Process Stream Flows		Stream Number										
Stream Component		1	2	3	4	5	6	7	9	10	11 est	11*
U, kgs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E+05	0.00E+00	0.00E+00	0.00E+00	1.25E+05	1.31E+03	1329.707	
Pu, gms	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-02	0.00E+00	0.00E+00	0.00E+00	4.55E-02	2.81E-02	0.048205	
Np, gms	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E+03	0.00E+00	0.00E+00	0.00E+00	3.60E+03	1.87E+03	3134.245	
Tc, gms	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+04	0.00E+00	0.00E+00	0.00E+00	1.03E+04	5.56E+02	590.61637	
Th, gms	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0000	

*Loop 1, manually enter "11 Est." values, then use "11 Calc" values n times for convergence of stream "11" with "11 Calc". Go to Loop 2.

Process Stream Flows											
Stream Component	Stream Number										
	12	13 est	13**	14	15	16	11 calc*	17	18	19	20
U, kgs	1328.38	6250.634	6575.4656	7.90E+03	1.25E+05	1.33E+05	1329.7066	1.32E+05	0.00E+00	1.32E+05	0.00E+00
Pu, gms	0.05	0.0031216	0.0032105	3.57E-02	4.55E-02	8.03E-02	0.0482053	3.21E-02	0.00E+00	3.21E-02	0.00E+00
Np, gms	3102.90	299.56957	311.857400	2.73E+03	3.60E+03	6.27E+03	3134.2449	3.13E+03	0.00E+00	3.12E+03	0.00E+00
Tc, gms	584.71	1017.8263	1121.0489	1.67E+03	1.03E+04	1.18E+04	590.61637	1.12E+04	0.00E+00	1.12E+04	0.00E+00
Th, gms	0.00	0	0	0.00E+00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00	0	0	0.00E+00	0.00E+00	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00	0	0	0.00E+00	0.00E+00	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**Loop 2 (after convergence of Loop 1), manually enter "13 Est." values, then use "23" values m times for convergence of "13" with "23".

Go back to Loop 1 as required for overall convergence.

Process Stream Flows											
Stream Component	Stream Number										
	21	22	23**	25	26	27	28	29	30	31	32
U, kgs	1.32E+05	1.25E+05	6575.4656	1.33E+00	7.90E-02	1.33E+02	1.32E+02	2.66E-01	2.66E+02	1.20E+04	1.00E+02
Pu, gms	3.21E-02	2.89E-02	0.0032105	4.82E-04	1.53E-02	8.12E-04	3.21E-05	1.66E-05	1.66E-02	7.88E-05	0.00E+00
Np, gms	3.12E+03	2.81E+03	311.857372	3.13E+01	6.83E+02	6.33E+01	1.57E+01	7.93E-01	7.92E+02	3.10E-02	2.30E+01
Tc, gms	1.12E+04	1.01E+04	1121.0489	5.91E+00	3.41E+01	1.19E+02	1.12E+01	1.71E-01	1.70E+02	1.09E-01	2.30E+03
Th, gms	0.00E+00	0.00E+00	0	0.00E+00							
	0.00E+00	0.00E+00		0.00E+00							
	0.00E+00	0.00E+00		0.00E+00							

Process Stream Flows											
Stream Component	Stream Number										
	33	34	35				40	41	42	43	44
U, kgs	1.24E+04	0.00E+00	0.00E+00				1.00E+06	1.00E+03	2.00E+05	7.00E+05	2.80E+05
Pu, gms	1.67E-02	0.00E+00	0.00E+00				6.57E-03	6.57E-06	1.31E-03	4.60E-03	1.84E-03
Np, gms	8.16E+02	0.00E+00	0.00E+00				2.58E+00	2.58E-03	5.16E-01	1.81E+00	7.22E-01
Tc, gms	2.47E+03	0.00E+00	0.00E+00				9.10E+00	9.10E-03	1.82E+00	6.37E+00	2.55E+00
Th, gms	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Process Stream Flows											
Stream Component	Stream Number										
	45	46	47	48	49	50	51	52	53	54	55
U, kgs	2.80E+05	8.40E+04	1.40E+05	1.40E+05	5.65E+05	1.00E+05	1.40E+05	5.60E+04	2.96E+05	2.96E+05	
Pu, gms	1.84E-03	5.52E-04	9.20E-04	9.20E-04	3.71E-03	6.57E-04	9.20E-04	3.68E-04	1.94E-03	1.94E-03	
Np, gms	7.22E-01	2.17E-01	3.61E-01	3.61E-01	1.46E+00	2.58E-01	3.61E-01	1.44E-01	7.64E-01	7.64E-01	
Tc, gms	2.55E+00	7.64E-01	1.27E+00	1.27E+00	5.14E+00	9.10E-01	1.27E+00	5.10E-01	2.69E+00	2.69E+00	
Th, gms	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

Mass Balance Checks					
Stream Component	Stream Comparison				
	Out-In	% Input	Str 11a-11	% Str 11	Str23-13
U, kgs	0.0000	0.0000	0.0000	0.0000	0.0000
Pu, gms	0.0000	0.0002	0.0000	-0.0001	0.0000
Np, gms	0.0001	0.0000	-0.0001	0.0000	0.0000
Tc, gms	0.0000	0.0000	0.0000	0.0000	0.0000
Th, gms	0.0000	0.0000	0.0000	0.0000	0.0000

Component Distribution			
Fract Res	Fract Sdg	Fract Pro	Totals
0.0000	0.0901	0.9099	1.0000
0.0000	0.3657	0.6339	0.9996
0.0000	0.2251	0.7747	0.9998
0.0000	0.1967	0.8033	1.0000
0.0000	0.0000	0.0000	0.0000

Process Stream Concentrations on U Basis											
Stream Component	Stream Number										
	1	2	3	4	5	6	7	9	10	11 est	11
U, kgs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E+05	0.00E+00	0.00E+00	0.00E+00	1.25E+05	1.31E+03	1.33E+03
Pu, ppb/U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.63E-01	0.00E+00	0.00E+00	0.00E+00	3.63E-01	2.14E+01	3.63E+01
Np, ppb/U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.88E+04	0.00E+00	0.00E+00	0.00E+00	2.88E+04	1.42E+06	2.36E+06
Tc, ppb/U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.19E+04	0.00E+00	0.00E+00	0.00E+00	8.19E+04	4.23E+05	4.44E+05
Th, ppb/U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Process Stream Concentrations on U Basis											
Stream Component	Stream Number										
	12	13 est	13	14	15	16	11 cal	17	18	19	20
U, kgs	1.33E+03	6.25E+03	6.58E+03	7.90E+03	1.25E+05	1.33E+05	1.33E+03	1.32E+05	0.00E+00	1.32E+05	0.00E+00
Pu, ppb/U	3.59E+01	4.99E-01	4.88E-01	4.51E+00	3.63E-01	6.04E-01	3.63E+01	2.44E-01	0.00E+00	2.44E-01	0.00E+00
Np, ppb/U	2.34E+06	4.79E+04	4.74E+04	3.46E+05	2.88E+04	4.71E+04	2.36E+06	2.38E+04	0.00E+00	2.37E+04	0.00E+00
Tc, ppb/U	4.40E+05	1.63E+05	1.70E+05	2.11E+05	8.19E+04	8.88E+04	4.44E+05	8.52E+04	0.00E+00	8.52E+04	0.00E+00
Th, ppb/U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Process Stream Concentrations on U Basis											
Stream Component	Stream Number										
	21	22	23	25	26	27	28	29	30	31	32
U, kgs	1.32E+05	1.25E+05	6.58E+03	1.33E+00	7.90E-02	1.33E+02	1.32E+02	2.66E-01	2.66E+02	1.20E+04	1.00E+02
Pu, ppb/U	2.44E-01	2.31E-01	4.88E-01	3.63E+02	1.93E+05	6.10E+00	2.44E-01	6.24E+01	6.24E+01	6.57E-03	0.00E+00
Np, ppb/U	2.37E+04	2.25E+04	4.74E+04	2.36E+07	8.64E+09	4.76E+05	1.19E+05	2.98E+06	2.98E+06	2.58E+00	2.30E+05
Tc, ppb/U	8.52E+04	8.08E+04	1.70E+05	4.44E+06	4.32E+08	8.96E+05	8.52E+04	6.41E+05	6.41E+05	9.08E+00	2.30E+07
Th, ppb/U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Process Stream Flows											
Stream Component	Stream Number										
	33	34	35				40	41	42	43	44
U, kgs	1.24E+04	0.00E+00	0.00E+00				1.00E+06	1.00E+03	2.00E+05	7.00E+05	2.80E+05
Pu, ppb U	1.35E+00	0.00E+00	0.00E+00				6.57E-03	6.57E-03	6.57E-03	6.57E-03	6.57E-03
Np, ppb U	6.59E+04	0.00E+00	0.00E+00				2.58E+00	2.58E+00	2.58E+00	2.58E+00	2.58E+00
Tc, ppb U	2.00E+05	0.00E+00	0.00E+00				9.10E+00	9.10E+00	9.10E+00	9.10E+00	9.10E+00
Th, ppb U	0.00E+00	0.00E+00	0.00E+00				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Rad Component	Stream Number										
	1	2	3	4	5	6	7	9	10	11 est	11
α Ratio	0.000	0.000	0.0000	0.000	0.284	0.000	0.000	0.000	0.284	14.61	24.31
β Ratio	0.000	0.000	0.0000	0.000	0.692	0.000	0.000	0.000	0.692	3.57	3.75
γ Ratio											

Rad Component	Stream Number										
	12	13 est	13	14	15	16	11 cal	17	18	19	20
α Ratio	24.09	0.455	0.450	3.433	0.284	0.466	24.31	0.226	0.000	0.225	0.000
β Ratio	3.72	1.375	1.439	1.786	0.692	0.750	3.75	0.720	0.000	0.720	0.000
γ Ratio											

Rad Component	Stream Number										
	21	22	23	25	26	27	28	29	30	31	31
α Ratio	0.225	0.213	0.450	243.06	98958.4	4.706	0.968	33.433	33.438	0.001	1.79
β Ratio	0.720	0.682	1.439	37.50	3643.5	7.568	0.720	5.410	5.410	0.000	194
γ Ratio											

Rad Component	Stream Number										
	33	34	35				40	41	42	43	44
α Ratio	0.735	0.000	0.000				0.0011	0.0011	0.0011	0.0011	0.0011
β Ratio	1.687	0.000	0.000				7.68E-05	7.68E-05	7.68E-05	7.68E-05	7.68E-05
γ Ratio											

Notes:

1. Y-12 analysis of incoming SRS UNH in the 1982-1984 timeframe assumed for UNH and U metal feed streams for the duration of campaign
2. SRS data shows significantly less Np than Y-12
3. INEEL analysis of Fernald DU metal assumed for composition of Y-12 stream 31 to S-3 Ponds
4. Sufficient DU added to stream 33 by way of stream 31 to yield observed U-235 content of S-3 sludge (i.e., 0.34% U-235)
5. Tc added to stream 33 by way of stream 32 to yield observed Tc sludge concentration in SE pond of 12,000 pCi/g wet wt
6. Th-228 not included in the calculation of α ratio
7. Assumed nominal specific activity of weapon grade HEU used in calculation of α ratio is 140 dpm/ μ g
8. Assumed nominal specific activity of uranium sample enriched in U-235 with no TRU for β ratio is based on Th-234, Pa-234, and Th-231

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO3	0.83	UF6	0.68
UO2	0.88	UF4	0.76	UO2F2	0.77
U3O8	0.85	UCI4	0.63	UO2(NO3)2	0.6
U Enrichment (% U-235) =		% U-235 Code	3.75E+01 DAC Value	U SpecAct uCi/g U Act to DAC	
Chemical Form of U code =		0.6	6E-10	6.25E+10	
SUM Constituent Act to DAC= 4.19E+10		Fraction Dose from Constituents		= 0.6696	
Constituent Data Units		uCi/g sample	uCi/g U	DAC Value	Act to DAC
Pu-238			0.00E+00	3.00E-12	0.00E+00
Pu-239			0.00E+00	2.00E-12	0.00E+00
Pu-240			0.00E+00	2.00E-12	0.00E+00
Np-237			0.00E+00	2.00E-12	0.00E+00
Am-241			0.00E+00	2.00E-12	0.00E+00
U-236			0.00E+00	6.00E-10	0.00E+00
Tc-99			0.00E+00	3.00E-07	0.00E+00
		uCi/g U	DAC Value	Act to DAC	
Pu-238		5.17E-03	3.00E-12	1.72E+09	
Pu-239		3.12E-06	2.00E-12	1.56E+06	
Pu-240		1.63E-06	2.00E-12	8.17E+05	
Np-237		2.03E-02	2.00E-12	1.02E+10	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		1.80E+01	6.00E-10	3.00E+10	
Tc-99		1.39E+00	3.00E-07	4.65E+06	

9212 HEU Process Stream 5 (Y-12 & SRS Data)

Assume

Pu ppb	0.36
Np ppb	28,800
Tc ppm	82
U-236 ppm	278,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO3	0.83	UF6	0.68
UO2	0.88	UF4	0.76	UO2F2	0.77
U3O8	0.85	UCI4	0.63	UO2(NO3)2	0.6
U Enrichment (% U-235) =		% U-235 62.6	U SpecAct uCi/g U 3.75E+01	Ratio	
Chemical Form of U code =		Code 0.6	DAC Value 6E-10	Act to DAC 6.25E+10	
SUM Constituent Act to DAC= 1.04E+12		Fraction Dose from Constituents = 16.5699			
Constituent Data Units	uCi/g sample	uCi/g U	DAC Value	Act to DAC	
Pu-238		0.00E+00	3.00E-12	0.00E+00	
Pu-239		0.00E+00	2.00E-12	0.00E+00	
Pu-240		0.00E+00	2.00E-12	0.00E+00	
Np-237		0.00E+00	2.00E-12	0.00E+00	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		0.00E+00	6.00E-10	0.00E+00	
Tc-99		0.00E+00	3.00E-07	0.00E+00	
Pu-238		uCi/g U 5.21E-01	DAC Value 3.00E-12	Act to DAC 1.74E+11	
Pu-239		3.15E-04	2.00E-12	1.58E+08	
Pu-240		1.65E-04	2.00E-12	8.24E+07	
Np-237		1.66E+00	2.00E-12	8.32E+11	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		1.80E+01	6.00E-10	3.00E+10	
Tc-99		7.55E+00	3.00E-07	2.52E+07	

9212 HEU Process Stream 11 (Y-12 & SRS Data)

Assume

Pu ppb	36.3
Np ppb	2,360,000
Tc ppm	444
U-236 ppm	278,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO ₃	0.83	UF ₆	0.68
UO ₂	0.88	UF ₄	0.76	UO ₂ F ₂	0.77
U ₃ O ₈	0.85	UCI ₄	0.63	UO ₂ (NO ₃) ₂	0.6
U Enrichment (% U-235) =	62.6	% U-235	3.75E+01	U SpecAct uCi/g U	Ratio
Chemical Form of U code =	0.6	Code	DAC Value	Act to DAC	
SUM Constituent Act to DAC=	1.74E+11	Fraction Dose from Constituents	=	2.7756	
Constituent Data Units	uCi/g sample	uCi/g U	DAC Value	Act to DAC	
Pu-238		0.00E+00	3.00E-12	0.00E+00	
Pu-239		0.00E+00	2.00E-12	0.00E+00	
Pu-240		0.00E+00	2.00E-12	0.00E+00	
Np-237		0.00E+00	2.00E-12	0.00E+00	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		0.00E+00	6.00E-10	0.00E+00	
Tc-99		0.00E+00	3.00E-07	0.00E+00	
	uCi/g U	DAC Value	Act to DAC		
Pu-238	6.46E-02	3.00E-12	2.15E+10		
Pu-239	3.91E-05	2.00E-12	1.95E+07		
Pu-240	2.04E-05	2.00E-12	1.02E+07		
Np-237	2.44E-01	2.00E-12	1.22E+11		
Am-241	0.00E+00	2.00E-12	0.00E+00		
U-236	1.80E+01	6.00E-10	3.00E+10		
Tc-99	3.59E+00	3.00E-07	1.20E+07		

9212 HEU Process Stream 14 (Y-12 & SRS Data)

Assume

Pu ppb	4.5
Np ppb	346,000
Tc ppm	211
U-236 ppm	278,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO ₃	0.83	UF ₆	0.68
UO ₂	0.88	UF ₄	0.76	UO ₂ F ₂	0.77
U ₃ O ₈	0.85	UCI ₄	0.63	UO ₂ (NO ₃) ₂	0.6
U Enrichment (% U-235) =		% U-235 Code	62.6 0.83	U SpecAct uCi/g U DAC Value	3.75E+01 3E-10
Chemical Form of U code =				Ratio Act to DAC	
SUM Constituent Act to DAC=		6.95E+10		Fraction Dose from Constituents	= 0.5558
Constituent Data Units		uCi/g sample	uCi/g U	DAC Value	Act to DAC
Pu-238			0.00E+00	3.00E-12	0.00E+00
Pu-239			0.00E+00	2.00E-12	0.00E+00
Pu-240			0.00E+00	2.00E-12	0.00E+00
Np-237			0.00E+00	2.00E-12	0.00E+00
Am-241			0.00E+00	2.00E-12	0.00E+00
U-236			0.00E+00	3.00E-10	0.00E+00
Tc-99			0.00E+00	3.00E-07	0.00E+00
		uCi/g U		DAC Value	Act to DAC
Pu-238		3.45E-03		3.00E-12	1.15E+09
Pu-239		2.08E-06		2.00E-12	1.04E+06
Pu-240		1.09E-06		2.00E-12	5.45E+05
Np-237		1.68E-02		2.00E-12	8.39E+09
Am-241		0.00E+00		2.00E-12	0.00E+00
U-236		1.80E+01		3.00E-10	6.00E+10
Tc-99		1.45E+00		3.00E-07	4.82E+06

9212 HEU Process Stream 19 (Y-12 & SRS Data)

Assume

Pu ppb	0.24
Np ppb	23,800
Tc ppm	85
U-236 ppm	278,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO3	0.83	UF6	0.68
UO2	0.88	UF4	0.76	UO2F2	0.77
U3O8	0.85	UCI4	0.63	UO2(NO3)2	0.6
U Enrichment (% U-235) =	62.6	% U-235	3.75E+01	U SpecAct uCi/g U	Ratio
Chemical Form of U code =	1	Code	DAC Value	Act to DAC	
SUM Constituent Act to DAC=	6.95E+10	Fraction Dose from Constituents	=	0.5555	
Constituent Data Units	uCi/g sample	uCi/g U	DAC Value	Act to DAC	
Pu-238		0.00E+00	3.00E-12	0.00E+00	
Pu-239		0.00E+00	2.00E-12	0.00E+00	
Pu-240		0.00E+00	2.00E-12	0.00E+00	
Np-237		0.00E+00	2.00E-12	0.00E+00	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		0.00E+00	3.00E-10	0.00E+00	
Tc-99		0.00E+00	3.00E-07	0.00E+00	
	uCi/g U	DAC Value	Act to DAC		
Pu-238	3.45E-03	3.00E-12	1.15E+09		
Pu-239	2.08E-06	2.00E-12	1.04E+06		
Pu-240	1.09E-06	2.00E-12	5.45E+05		
Np-237	1.67E-02	2.00E-12	8.35E+09		
Am-241	0.00E+00	2.00E-12	0.00E+00		
U-236	1.80E+01	3.00E-10	6.00E+10		
Tc-99	1.45E+00	3.00E-07	4.82E+06		

9212 HEU Process Stream 22 (Y-12 & SRS Data)

Assume

Pu ppb	0.24
Np ppb	23,700
Tc ppm	85
U-236 ppm	278,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO3	0.83	UF6	0.68
UO2	0.88	UF4	0.76	UO2F2	0.77
U3O8	0.85	UCI4	0.63	UO2(NO3)2	0.6
U Enrichment (% U-235) =		% U-235 62.6	U SpecAct uCi/g U 3.75E+01	Ratio	
Chemical Form of U code =		Code 0.88	DAC Value 3E-10	Act to DAC 1.25E+11	
SUM Constituent Act to DAC= 7.90E+10		Fraction Dose from Constituents = 0.6319			
Constituent Data Units		uCi/g sample	uCi/g U	DAC Value	Act to DAC
Pu-238			0.00E+00	3.00E-12	0.00E+00
Pu-239			0.00E+00	2.00E-12	0.00E+00
Pu-240			0.00E+00	2.00E-12	0.00E+00
Np-237			0.00E+00	2.00E-12	0.00E+00
Am-241			0.00E+00	2.00E-12	0.00E+00
U-236			0.00E+00	3.00E-10	0.00E+00
Tc-99			0.00E+00	3.00E-07	0.00E+00
		uCi/g U	DAC Value	Act to DAC	
Pu-238		7.01E-03	3.00E-12	2.34E+09	
Pu-239		4.24E-06	2.00E-12	2.12E+06	
Pu-240		2.22E-06	2.00E-12	1.11E+06	
Np-237		3.34E-02	2.00E-12	1.67E+10	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		1.80E+01	3.00E-10	6.00E+10	
Tc-99		2.89E+00	3.00E-07	9.63E+06	

9212 HEU Process Stream 23 (Y-12 & SRS Data)

Assume

Pu ppb	0.488
Np ppb	47,400
Tc ppm	170
U-236 ppm	278,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO3	0.83	UF6	0.68
UO2	0.88	UF4	0.76	UO2F2	0.77
U3O8	0.85	UCI4	0.63	UO2(NO3)2	0.6
U Enrichment (% U-235) =	62.6	% U-235	3.75E+01	U SpecAct uCi/g U	Ratio
Chemical Form of U code =	0.6	Code	DAC Value	Act to DAC	
SUM Constituent Act to DAC=	1.01E+13	Fraction Dose from Constituents	=	161.3840	
Constituent Data Units	uCi/g sample	uCi/g U	DAC Value	Act to DAC	
Pu-238		0.00E+00	3.00E-12	0.00E+00	
Pu-239		0.00E+00	2.00E-12	0.00E+00	
Pu-240		0.00E+00	2.00E-12	0.00E+00	
Np-237		0.00E+00	2.00E-12	0.00E+00	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		0.00E+00	6.00E-10	0.00E+00	
Tc-99		0.00E+00	3.00E-07	0.00E+00	
	uCi/g U	DAC Value	Act to DAC		
Pu-238	5.21E+00	3.00E-12	1.74E+12		
Pu-239	3.15E-03	2.00E-12	1.58E+09		
Pu-240	1.65E-03	2.00E-12	8.24E+08		
Np-237	1.66E+01	2.00E-12	8.32E+12		
Am-241	0.00E+00	2.00E-12	0.00E+00		
U-236	1.80E+01	6.00E-10	3.00E+10		
Tc-99	7.55E+01	3.00E-07	2.52E+08		

9212 HEU Process Stream 25 (Y-12 & SRS Data)

Assume

Pu ppb	363
Np ppb	23,600,000
Tc ppm	4,440
U-236 ppm	278,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO ₃	0.83	UF ₆	0.68
UO ₂	0.88	UF ₄	0.76	UO ₂ F ₂	0.77
U ₃ O ₈	0.85	UCI ₄	0.63	UO ₂ (NO ₃) ₂	0.6
U Enrichment (% U-235) =	62.6	% U-235	3.75E+01	U SpecAct uCi/g U	Ratio
Chemical Form of U code =	0.6	Code	DAC Value	Act to DAC	
SUM Constituent Act to DAC=	3.97E+15	Fraction Dose from Constituents	=	63516.2677	
Constituent Data Units	uCi/g sample	uCi/g U	DAC Value	Act to DAC	
Pu-238		0.00E+00	3.00E-12	0.00E+00	
Pu-239		0.00E+00	2.00E-12	0.00E+00	
Pu-240		0.00E+00	2.00E-12	0.00E+00	
Np-237		0.00E+00	2.00E-12	0.00E+00	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		0.00E+00	6.00E-10	0.00E+00	
Tc-99		0.00E+00	3.00E-07	0.00E+00	
	uCi/g U	DAC Value	Act to DAC		
Pu-238	2.77E+03	3.00E-12	9.24E+14		
Pu-239	1.68E+00	2.00E-12	8.38E+11		
Pu-240	8.76E-01	2.00E-12	4.38E+11		
Np-237	6.09E+03	2.00E-12	3.05E+15		
Am-241	0.00E+00	2.00E-12	0.00E+00		
U-236	1.80E+01	6.00E-10	3.00E+10		
Tc-99	7.34E+03	3.00E-07	2.45E+10		

9212 HEU Process Stream 26 (Y-12 & SRS Data)

Assume

Pu ppb	193,000
Np ppb	8,640,000,000
Tc ppm	432,000
U-236 ppm	278,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO3	0.83	UF6	0.68
UO2	0.88	UF4	0.76	UO2F2	0.77
U3O8	0.85	UCI4	0.63	UO2(NO3)2	0.6
U Enrichment (% U-235) =	62.6	% U-235	3.75E+01	U SpecAct uCi/g U	Ratio
Chemical Form of U code =	0.6	Code	DAC Value	Act to DAC	
SUM Constituent Act to DAC=	2.27E+11	Fraction Dose from Constituents	=	3.6319	
Constituent Data Units	uCi/g sample	uCi/g U	DAC Value	Act to DAC	
Pu-238		0.00E+00	3.00E-12	0.00E+00	
Pu-239		0.00E+00	2.00E-12	0.00E+00	
Pu-240		0.00E+00	2.00E-12	0.00E+00	
Np-237		0.00E+00	2.00E-12	0.00E+00	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		0.00E+00	6.00E-10	0.00E+00	
Tc-99		0.00E+00	3.00E-07	0.00E+00	
	uCi/g U	DAC Value	Act to DAC		
Pu-238	8.76E-02	3.00E-12	2.92E+10		
Pu-239	5.29E-05	2.00E-12	2.65E+07		
Pu-240	2.77E-05	2.00E-12	1.38E+07		
Np-237	3.36E-01	2.00E-12	1.68E+11		
Am-241	0.00E+00	2.00E-12	0.00E+00		
U-236	1.80E+01	6.00E-10	3.00E+10		
Tc-99	1.52E+01	3.00E-07	5.08E+07		

9212 HEU Process Stream 27 (Y-12 & SRS Data)

Assume

Pu ppb	6.1
Np ppb	476,000
Tc ppm	896
U-236 ppm	278,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO3	0.83	UF6	0.68
UO2	0.88	UF4	0.76	UO2F2	0.77
U3O8	0.85	UCI4	0.63	UO2(NO3)2	0.6
U Enrichment (% U-235) =	62.6	% U-235	3.75E+01	U SpecAct uCi/g U	Ratio
Chemical Form of U code =	0.6	Code	DAC Value	Act to DAC	
SUM Constituent Act to DAC=	1.38E+12	Fraction Dose from Constituents	=	22.0674	
Constituent Data Units	uCi/g sample	uCi/g U	DAC Value	Act to DAC	
Pu-238		0.00E+00	3.00E-12	0.00E+00	
Pu-239		0.00E+00	2.00E-12	0.00E+00	
Pu-240		0.00E+00	2.00E-12	0.00E+00	
Np-237		0.00E+00	2.00E-12	0.00E+00	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		0.00E+00	6.00E-10	0.00E+00	
Tc-99		0.00E+00	3.00E-07	0.00E+00	
	uCi/g U	DAC Value	Act to DAC		
Pu-238	8.96E-01	3.00E-12	2.99E+11		
Pu-239	5.42E-04	2.00E-12	2.71E+08		
Pu-240	2.83E-04	2.00E-12	1.42E+08		
Np-237	2.10E+00	2.00E-12	1.05E+12		
Am-241	0.00E+00	2.00E-12	0.00E+00		
U-236	1.80E+01	6.00E-10	3.00E+10		
Tc-99	1.09E+01	3.00E-07	3.63E+07		

9212 HEU Process Stream 30 (Y-12 & SRS Data)

Assume

Pu ppb	62.4
Np ppb	2,980,000
Tc ppm	641
U-236 ppm	278,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO ₃	0.83	UF ₆	0.68
UO ₂	0.88	UF ₄	0.76	UO ₂ F ₂	0.77
U ₃ O ₈	0.85	UCI ₄	0.63	UO ₂ (NO ₃) ₂	0.6
U Enrichment (% U-235) =	62.6	% U-235	3.75E+01	U SpecAct uCi/g U	Ratio
Chemical Form of U code =	0.6	Code	DAC Value	Act to DAC	
SUM Constituent Act to DAC=	3.29E+10	Fraction Dose from Constituents	=	0.5270	
Constituent Data Units	uCi/g sample	uCi/g U	DAC Value	Act to DAC	
Pu-238		0.00E+00	3.00E-12	0.00E+00	
Pu-239		0.00E+00	2.00E-12	0.00E+00	
Pu-240		0.00E+00	2.00E-12	0.00E+00	
Np-237		0.00E+00	2.00E-12	0.00E+00	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		0.00E+00	6.00E-10	0.00E+00	
Tc-99		0.00E+00	3.00E-07	0.00E+00	
	uCi/g U	DAC Value	Act to DAC		
Pu-238	1.94E-02	3.00E-12	6.46E+09		
Pu-239	1.17E-05	2.00E-12	5.86E+06		
Pu-240	6.13E-06	2.00E-12	3.06E+06		
Np-237	4.65E-02	2.00E-12	2.32E+10		
Am-241	0.00E+00	2.00E-12	0.00E+00		
U-236	1.94E+00	6.00E-10	3.24E+09		
Tc-99	3.40E+00	3.00E-07	1.13E+07		

9212 HEU Process Stream 33 (Y-12 & SRS Data)

Assume

Pu ppb	1.35
Np ppb	65,900
Tc ppm	200
U-236 ppm	30,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	84
Pu-239	14
Pu-240	2
Pu-241	0
Pu-242	0

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO ₃	0.83	UF ₆	0.68
UO ₂	0.88	UF ₄	0.76	UO ₂ F ₂	0.77
U ₃ O ₈	0.85	UCI ₄	0.63	UO ₂ (NO ₃) ₂	0.6
U Enrichment (% U-235) =	78.2	% U-235	U SpecAct uCi/g U		
Chemical Form of U code =	0.83	Code	DAC Value	Ratio	
SUM Constituent Act to DAC=	2.32E+10	Fraction Dose from Constituents	=	0.1369	
Constituent Data Units	uCi/g sample	uCi/g U	DAC Value	Act to DAC	
Pu-238		0.00E+00	3.00E-12	0.00E+00	
Pu-239		0.00E+00	2.00E-12	0.00E+00	
Pu-240		0.00E+00	2.00E-12	0.00E+00	
Np-237		0.00E+00	2.00E-12	0.00E+00	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		0.00E+00	3.00E-10	0.00E+00	
Tc-99		0.00E+00	3.00E-07	0.00E+00	
	uCi/g U	DAC Value	Act to DAC		
Pu-238	1.88E-06	3.00E-12	6.27E+05		
Pu-239	5.87E-06	2.00E-12	2.94E+06		
Pu-240	3.00E-06	2.00E-12	1.50E+06		
Np-237	3.31E-03	2.00E-12	1.66E+09		
Am-241	0.00E+00	2.00E-12	0.00E+00		
U-236	6.47E+00	3.00E-10	2.16E+10		
Tc-99	2.21E-03	3.00E-07	7.37E+03		

9212 HEU Process Stream 4 (ICPP + Data)

Assume

Pu ppb	0.11
Np ppb	4,700
Tc ppm	0.13
U-236 ppm	100,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	0.1
Pu-239	86.1
Pu-240	12
Pu-241	1.6
Pu-242	0.2

Chemical Forms of Uranium					
Form	Code	Form	Code	Form	Code
U (metal)	1	UO ₃	0.83	UF ₆	0.68
UO ₂	0.88	UF ₄	0.76	UO ₂ F ₂	0.77
U ₃ O ₈	0.85	UCI ₄	0.63	UO ₂ (NO ₃) ₂	0.6
U Enrichment (% U-235) =	78.2	% U-235	U SpecAct uCi/g U		
Chemical Form of U code =	0.6	Code	DAC Value	Act to DAC	
SUM Constituent Act to DAC=	1.24E+10	Fraction Dose from Constituents	=	0.1467	
Constituent Data Units	uCi/g sample	uCi/g U	DAC Value	Act to DAC	
Pu-238		0.00E+00	3.00E-12	0.00E+00	
Pu-239		0.00E+00	2.00E-12	0.00E+00	
Pu-240		0.00E+00	2.00E-12	0.00E+00	
Np-237		0.00E+00	2.00E-12	0.00E+00	
Am-241		0.00E+00	2.00E-12	0.00E+00	
U-236		0.00E+00	6.00E-10	0.00E+00	
Tc-99		0.00E+00	3.00E-07	0.00E+00	
	uCi/g U	DAC Value	Act to DAC		
Pu-238	1.88E-06	3.00E-12	6.27E+05		
Pu-239	5.87E-06	2.00E-12	2.94E+06		
Pu-240	3.00E-06	2.00E-12	1.50E+06		
Np-237	3.31E-03	2.00E-12	1.66E+09		
Am-241	0.00E+00	2.00E-12	0.00E+00		
U-236	6.47E+00	6.00E-10	1.08E+10		
Tc-99	2.21E-03	3.00E-07	7.37E+03		

9212 HEU Process Stream 5 (ICPP + Data)

Assume

Pu ppb	0.11
Np ppb	4,700
Tc ppm	0.13
U-236 ppm	100,000

Assume U @ 62.5% U-235

Assume Weapons Pu Dist

Pu-238	0.1
Pu-239	86.1
Pu-240	12
Pu-241	1.6
Pu-242	0.2